EFFECT OF ORGANIC FERTILIZATION ON GROWTH AND QUALITY OF SUPERIOR GRAPEVINE

By

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B.Sc. (Agric. Sci.), Fac. Agric., Al-Azhar Univ., Egypt, 1994
M.Sc. (Pomology), Fac. Agric., Al-Azhar Univ., Egypt, 2007

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APPROVAL SHEET

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Title of Thesis: Effect of organic fertilization on growth and quality of Superior grapevine

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ABSTRACT

This study was carried out during the three consecutive seasons of 2009, 2010 and 2011 in sandy loam soil at 64 kilometer from Cairo on the desert road to Alexandria on ten years-old 'Superior Seedless' grapevines, to study the possibility of using the organic and bio fertilization partially instead of complete mineral fertilizers as applied at 25 to 100 % out of the recommended NPK rate .Organic fertilizers (compost plant residues) with two natural rocks,.viz., rock phosphate and feldspar were applied with or without biofertilizers (biogen , phosphorin and potassiumag) at 30 g/vine. The results indicated that application of 50% (compost, rock phosphate and feldspar) + 50% of the NPK mineral recommended fertilizers N (157 g/ vine), P_2O_5 (87 g/ vine) and K_2O (112 g/ vine) + bio-fertilizer was the best management system for ensuring the best vegetative growth parameters as shoots length, number of leaves/shoot and leaf area and leaf mineral content. It also achieved the best yield with its components as number of clusters per vine and weight of each individual cluster, improved physical and chemical characteristics of berries as total soluble solids, total acidity, TSS/acid ratio and total sugars, and reduced nitrate and nitrite contents of berries of 'Superior Seedless' grapevines. Therefore, these organic and natural rocks fertilizers in combination with NPK bio-fertilizers can reduce the need for about 50% of NPK mineral fertilizers. In addition, minimized the production cost and the environmental pollution which could be occurred by excess of chemical fertilizers.

Key words: Grapevines, Superior Seedless, mineral fertilizer, organic, compost, biofertilizer, natural rocks, yield and leaf mineral content.

DEDICATION

I dedicate this work to whom my heart felt thanks; to my mother and my sisters for all the support they lovely offered along the period of my post graduation. Also I dedicate this work to my father soul.

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INTRODUCTION

Grapevine is one of the major horticultural crops throughout the world, especially in the tropics areas. Many cultivars of *Vitis vinifera* L. have been commercialized over the past several centuries such as seedless varieties group. Grapevine culture is of great importance in Europe where it occupies more than 60% of the cultivated area (Chapman, 1990).

Botanically, grape belongs to the genus Vitis, under the family Vitaceae, which includes more than 60 genera, most of them are used in ornamental purposes and the little produces edible fruits. Berries from these grape cvs have higher nutritional status and could be consumed fresh as table grapes or dried to be used as raisins, while the juice may be used in fresh pasteurized form or be fermented to make wine types (Stove, 1971).

Fruits of the better grape cvs are eaten in dessert, canned or used for making juice, raisins, wines and other preserves. Grapes have high nutritional value because of their higher content of sugars, vitamins and minerals. Also they are used for curing of gastrointestinal diseases as well as urinary and respiratory diseases. Recently, grapes are found to be effective in treating of cancer (Porro and Lacono, 1999 and Txinak *et al.,* 2003).

Grapes are considered from the most important fruit crops all over the world and the second fruit crop after citrus in Egypt. Grape vine occupies the second position regarding the cultivated area and total of fruit production in Egypt. The total cultivated areas attained 188543 feddans, total fruiting areas 157766 feddans with annual

production 1391749 metric ton according to the statistics of the ministry of agriculture in 2012. About 50% of the total vineyards lie in the new reclaimed areas along the desert roads in North and Middle Egypt, which are cultivated with newly introduced vine cultivars. Most of those cultivars have a great potentiality for exportation such as seedlessness, early ripening and high fruit productivity.

'Superior' grapevine cultivar is considered a prime and a popular grapevine cv, successfully grown under Egyptian conditions. Such cultivar ripens early sometimes in the last week of May under sandy soil conditions. In addition, it has a greater potentiality of export to foreign markets due to its early ripening character which reduced competition. In spite of introducing numerous grapevine cvs recently to Egypt, such grapevine cv is still one of the prime, main, popular and the most profitable grapevine cv.

Fertilization is considered as an important practice during the growing season of fruit trees, especially nitrogen, phosphorus and potassium fertilization.

Nitrogen plays a key role in the nutrition of grapevines. It is responsible for the biosynthesis of proteins, organic nutrients, enhancing cell division and chlorophylls, building cellulose and lignin which play an important role in forming plant structure. It is also beneficial in the synthesis of enzymes. As a matter of fact, fruits trees did not produce fruits without supplying with such essential macro-element (Litvinov, and Zakharchenko, 1978; Tisdale *et al.*, 1985; Mengel and Kirkby, 1987 and Miller *et al.*, 1990).

Nitrogen fertilization of grapevines especially the newly introduced cvs were varied among site of the area, applied amount, sources and methods of applications (Yagodin, 1990). Therefore, adjusting N nutrition is still questionlized and need more studies about the best and new techniques of N management for producing the highest and economical yield and for improving physical and chemical properties of the fruits (James *et al.*, 1989).

Nitrogen fertilization is an important and limiting factor for growth and productivity of grapevines, since considerable amounts of nitrogen applied to the soil are usually lost through leaching, accordingly a part of N must be added via organic source. However, grape growers realized the ability to correct N deficiency through soil application alone. It is suggested that any treatment that positively affect growth of grapevines would be reflected on improving fruit characteristics (Nijjar, 1985 and Cook, 1986).

Recently, trials were conducted to adjust the amount of mineral N that added to fruit orchards to protect our environment from dangerous pollution (Mengel and Kirkby, 1987 and Mengel, 1984).

Phosphorus content of soil can be assimilated only as soluble phosphate. Hence, the use of Rock phosphate as a fertilizer for phosphorus deficient soils has received a significant interest in the recent years since they are natural, inexpensive and available fertilizer. However their solubilization rarely occurs in alkaline soils (Caravaca *et al.*, 2005). Physical and chemical weathering of Rock phosphate is mainly realized along plant roots in the rhizosphere. This part of soil supports large microbial communities that facilitate weathering of